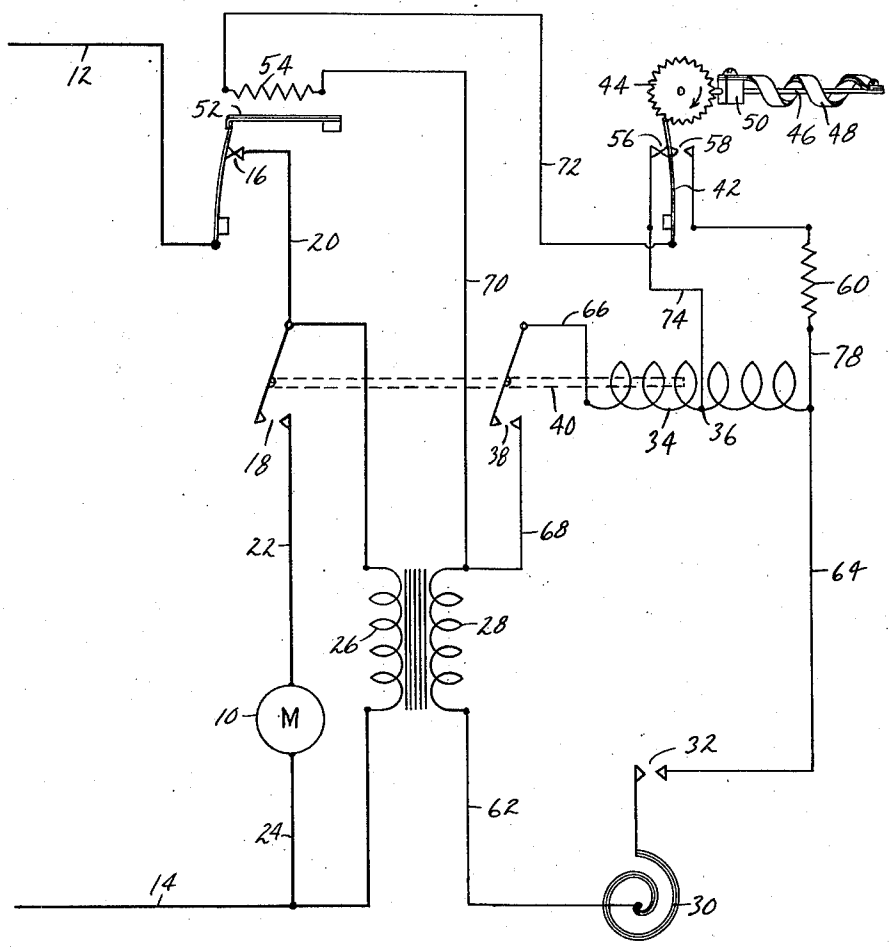
Dec. 14, 1937. L. M. PERSONS 2,102,091

SAFETY SWITCH HEATER CIRCUIT FOR BURNER CONTROLS

Filed Aug. 13, 1935



Witness
H. S. Munzenmaier

Inventor
Lawrence M. Persons
By Bair, Freeman & Sinclair
Attorneys

UNITED STATES PATENT OFFICE

2,102,091

SAFETY SWITCH HEATER CIRCUIT FOR BURNER CONTROLS

Lawrence M. Persons, Des Moines, Iowa, assignor to Penn Electric Switch Co., Des Moines, Iowa, a corporation of Iowa

Application August 13, 1935, Serial No. 35,988

3 Claims. (Cl. 158—28)

An object of my present invention is to provide a safety switch heater circuit for burner controls, which is extremely sensitive to combustion failure, although not so sensitive to establishment of a starting circuit, thus securing the desired sensitivity for safety in a burner circuit, yet eliminating any possibility of the safety switch operating when the burner is first started.

More particularly, it is my object to provide in connection with a relay and a safety switch heater a means operated by a combustion switch for maintaining the safety switch heater adjacent its tripping point, so that immediately upon combustion failure the safety switch will operate.

A further object is to provide a combustion switch operable to disconnect a safety switch heater from one circuit of high value and connect it in another circuit of low value when combustion occurs instead of entirely disconnecting the safety switch heater according to the general practice.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my safety switch heater circuit for burner controls, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawing, in which:

The figure is a diagrammatic view, showing a safety switch heater circuit for burner controls embodying my invention.

On the accompanying drawing, I have used the reference numeral 10 to indicate the motor of an oil burner, such as the blower and/or fuel feed motor of the burner. It is supplied with current from wires 12 and 14 through a safety switch 16 and a burner switch 18. Additional wires 20, 22 and 24 are provided for connecting the motor and switch with the wires 12 and 14.

Connected with the wires 14 and 20 is the primary coil 26 of a transformer, the secondary coil of which is indicated at 28.

The secondary coil 28 is provided for establishing a room thermostat circuit, controlled by a room thermostat 30, the contacts of which are indicated at 32.

A relay coil 34 is provided having a center tap 36. A holding switch 38 is provided for the relay coil 34 and both it and the motor switch 18 are closed by the relay coil attracting an armature 40.

My circuit further includes a combustion switch comprising a leaf spring 42 anchored at one end and having its other end engaging the notched periphery of a disc 44. The disc 44 is connected to a rod 46 extending into the stack or combustion chamber of a furnace, and is actuated by a bimetal coil 48, having one end anchored to the rod 46 and its other end anchored to a stationary support 50.

The safety switch 16 is adapted to be manually latched. A bimetal latch 52 normally holds it in latched position. The latch 52 can be warped to unlatched position by sufficient energization of a heater coil 54.

The combustion switch having the leaf spring 42 includes first contacts 56 closed in the absence of combustion and second contacts 58 closed in the presence of combustion.

An impedance element, such as a resistance coil 60 is provided for an important purpose, which will hereinafter appear.

Connecting the parts 28, 32, 34, 36, 38, 54, 56, 58 and 60 together are wires 62, 64, 66, 68, 70, 72, 74, 76 and 78.

Practical operation

In the operation of my invention, when the room thermostat 30 calls for heat, a starting circuit is established by closing of the contacts 32, which includes the following elements: 62, 30, 32, 64, the right half of the coil 34, 36, 74, 56, 42, 72, 54 and 70, the secondary coil 28, of course, furnishing the current for this circuit.

A small portion of the current will be shunted across from the center tap 36 of the relay coil to the secondary coil 28 through the left half of the relay coil and the elements 66, 38 and 68, the holding switch 38 thus being in closed position for holding purposes, when the starting circuit is subsequently broken due to establishment of combustion.

If combustion does not occur, the starting circuit through the safety switch heater 54 will after a period of time trip out the latch 52, permitting the entire circuit to be broken through the safety switch, whereupon the trouble must be remedied and the switch reset manually.

If combustion does occur, the disc 44 of the combustion switch will rotate counter-clockwise, due to the action of the heat on the bimetal coil 48, thereby opening the switch 56 and cutting out the heater 54.

A running circuit is then traceable through the following elements: 62, 30, 32, 64, 34, 66, 38 and 68.

Burner controls have heretofore been used which operate as just described. After the starting circuit is broken, the heater 54 cools down, so that subsequently when combustion fails, and

the contacts 56 are closed, a considerable time period elapses before the safety switch 16 can trip out.

In many instances of combustion failure, this is undesirable, and accordingly I provide the combustion switch contacts 58, which close upon combustion establishment and connect the impedance or resistance 60 in circuit with the heater 54, so that in addition to the running circuit traceable through the relay coil as in the last paragraph, a shunt circuit is traceable from the wire 64 through the following elements: 78, 60, 76, 58, 42, 72, 54 and 70. This maintains the heater 54 energized, but does not trip the latch 52, because I provide the element 60 in the form of a resistance having a greater resistance value than the resistance value of the right half of the relay coil 34. In this way, I can keep the temperature of the heater 54 substantially constant and at a point just below the temperature required for tripping the latch 52, so that whenever combustion fails and consequently the stack switch disc 44 rotates clockwise, the heater 54 will again be energized, the same as when the starting circuit was energized, thus resulting in immediate tripping out of the safety switch 16.

Upon combustion failure, the contacts 58 will open for disconnecting the load element 60 and the contacts 56 will close, whereupon the current then flowing through the heater 54 will be of greater value because of flowing from the wire 64 through the right half of the relay coil, rather than through the resistance 60, which cuts down the current more than this portion of the relay coil.

By the circuit arrangement disclosed, even though the safety switch 16 trips immediately upon combustion failure after it has been established, the circuit can operate only after an extended period of time upon establishment of the starting circuit, because prior to the starting circuit being established by the room thermostat, the heater 54 is cold, while prior to the same circuit being established due to combustion failure after it has been established, the safety switch will operate quickly because the heater is already partially heated to its trip-out temperature.

This provides a greater degree of safety as when combustion fails, it is desirable to quickly operate the safety switch.

Changes may be made in the arrangement and construction of the various parts of my switch heater circuit without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:

1. In a safety switch heater circuit for burner controls, the combination with a circuit having a relay, a room thermostat and a safety switch heater, of a combustion responsive switch having first contacts closed in the absence of combustion and second contacts closed in the presence of combustion, said first contacts being arranged to connect said safety switch heater in series circuit with a part of said relay, an impedance element, said second contacts being arranged to connect said safety switch heater in series circuit with said impedance element, and holding contacts for and closed by energization of said relay which are in series with all of said relay and thereby, together with the remaining part of said relay, shunt said safety switch heater when said first contacts are engaged and, together with all of said relay, shunt said impedance element and said safety switch heater when said second contacts are engaged.

2. In a safety switch actuator circuit for burner controls, the combination with a circuit having a relay, a room thermostat and a safety switch actuator, of a combustion responsive switch operable when in cold stack position to connect said safety switch actuator in circuit with a portion of said relay, and an impedance element, said combustion switch being operative when in hot stack position to disconnect said safety switch heater from the circuit of said portion of said relay and to connect it in series circuit with said impedance element.

3. In a safety switch actuator circuit for burner controls, the combination with a circuit having a relay, a room thermostat and a safety switch actuator, of a combustion responsive switch operable when in cold stack position to connect said safety switch actuator in circuit with a portion of said relay, an impedance element, said combustion switch being operative when in hot stack position to disconnect said portion of said relay from the circuit of said safety switch actuator and connect said safety switch actuator in series circuit with said impedance element, and holding contacts for and closed by energization of said portion of said relay which, in series with another portion of said relay, shunt said safety switch actuator when said combustion switch is in cold stack position and, in series with both portions of said relay, shunt both said impedance element and said safety switch actuator when said combustion switch is in hot stack position.

LAWRENCE M. PERSONS.